

PCT

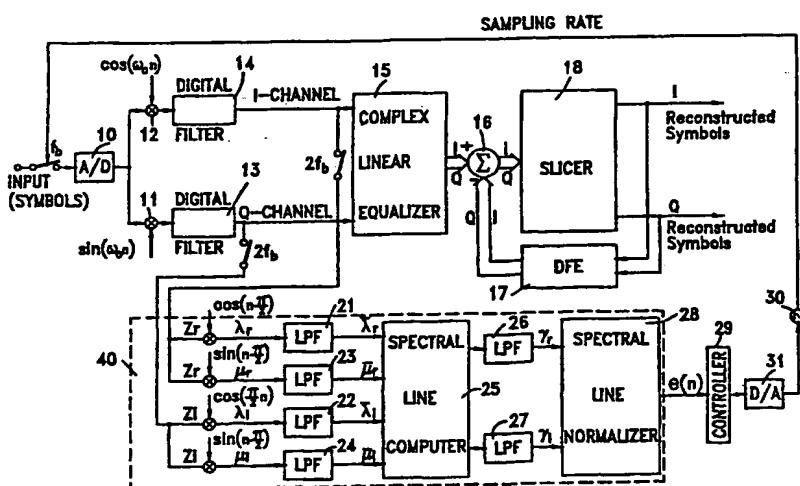
WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau



INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 6 : H04B 1/38, 1/50, H04L 5/12, 5/16	A1	(11) International Publication Number: WO 99/48219 (43) International Publication Date: 23 September 1999 (23.09.99)
(21) International Application Number: PCT/IL99/00154		
(22) International Filing Date: 18 March 1999 (18.03.99)		
(30) Priority Data: 123739 19 March 1998 (19.03.98) IL		
(71) Applicant (for all designated States except US): SAVAN COMMUNICATIONS LTD. [IL/IL]; Hamelacha Street 71a, 42504 Netanya (IL).		
(72) Inventors; and		
(75) Inventors/Applicants (for US only): PORAT, Boaz [IL/IL]; Shimshon Street 93, 34678 Haifa (IL). HARPAK, Amnon [IL/IL]; Moshe Dayan Street 62, 58671 Holon (IL). PELEG, Shimon [IL/IL]; Anchilevich Street 11, 45285 Hod-Hasharon (IL).		
(74) Agents: LUZZATTO, Kfir et al.; Luzzatto & Luzzatto, P.O. Box 5352, 84152 Beer-Sheva (IL).		

(54) Title: METHOD AND APPARATUS FOR CLOCK TIMING RECOVERY IN χ DSL, PARTICULARLY VDSL MODEMS



(57) Abstract

Method and modem for fast timing recovery of transmitted data between a master χ DSL modem and a slave χ DSL modem, over a noisy, high loss, high distortion wiring. Transmitted QAM symbols are received and sampled (10) at the slave modem. The sampled data is split into in-phase (I) and quadrature (Q) channels (11, 12), each of which is filtered by matched filter (13, 14). The filtered I and Q outputs are sampled at twice the symbol rate and the lower and upper band edge components are extracted by modulating each of the sampled sequence of I and Q outputs with two discrete time sequences: $\cos(0.5\pi n) = \dots, 1, 0, -1, 0, \dots$ and $\sin(0.5\pi n) = \dots, 0, 1, 0, -1, \dots$. Each of the resulting products is filtered with a first order low-pass filter (26, 27) and re-sampled again at the symbol rate. The Bit Error Rate is computed (28), and the slave modem switches from blind timing recovery mode, to data directed timing recovery mode, after the Bit Error Rate has sufficiently decreased.